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CHANGING GRAIN STORAGE COSTS

Farm vs. Elevator

By Thomas E. Hall

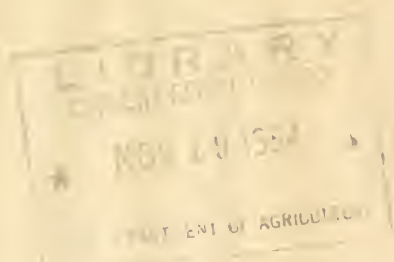
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FCS Circular 6

April 1954

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Changing Grain Storage Costs

Farm vs. Elevator

By Thomas E. Hall
Principal Agricultural Economist

FARMERS and others interested in investing in new storage facilities for their cash grain¹ have a problem and a challenge facing them—where and under what conditions can such facilities be built in order to add the least to their marketing costs during the many years they expect the facilities to be used.

This circular shows a comparison of farmers' costs for storing at home in permanent-type bins and cribs intended for use over a long period of years and for storing at elevators, and traces some of the reasons for the shift in many areas from farm to elevator storage.

It *does not* consider such parts of the broad problem of storage as: advantages or disadvantages of storing cash grain for later market instead of selling it as harvested, emergency cash grain storage problems caused by big crops, big carry-overs, lack of transportation or a combination of these factors. It *does not* consider facilities that may be needed temporarily because of a tight storage situation and

heavy price discounts at harvest; storing grain or grain reserves to be used at home as feed or seed; or *elevator storage costs* as they may be influenced by type, size, volume, financing, management or other factors. Other studies are underway or planned on some of these problems and will be reported on.

In general, it shows that as farm harvest and elevator handling have both become much more mechanized, the shift is definite to more elevator and less farm storage of cash grain. Tangible reasons for this have been brought out in the three areas studied—Oklahoma, North Dakota and Indiana. In all three States, under average conditions, farm storage proved more expensive than elevator for most combined grain. Farm crib storage is cheaper for new crop corn as long as it continues to be harvested as ear corn.

Thirty years ago farmers had little direct interest in grain storage facilities—except their own farm granaries and cribs. Then about 15 years ago in the heavy cash wheat areas they began to build storage additions to their existing cooperative elevators. Later, particularly

¹ Cash grain is grain that will not be consumed on the farm, but will be sold through commercial outlets.



Only within the past 15 years have farmers begun to build any large amount of storage capacity at their local and terminal cooperative elevators. Through regional cooperatives, farmers now own a total capacity of 105 million bushels at subterminal and terminal elevators. These are the Union Equity Cooperative Exchange elevators, Enid, Oklahoma.

since World War II, as farmers demanded more elevator storage, these additions were inadequate, and many new concrete elevators have been constructed.

Today about 2,500 cooperatives marketing grain in the United States—these owned by at least 1 million farmers—have elevator capacity at local shipping points for around 250 million bushels.² Also, through their regional cooperatives, farmers own subterminal and terminal elevators at 39 locations with total capacity of more than 105 million bushels.³

At present, particularly in wheat areas of the southern half of the Great Plains and in the Pacific Northwest, new cooperative elevators of from one to several hundred

thousand bushel capacity are commonplace at country shipping points. In addition, farmers, by cooperative effort, have built several large terminal elevators. Farmers in the northern half of the Great Plains belt have also built some new elevators, particularly at subterminal points, but are still using farm storage for most of their cash grain. Relatively little elevator capacity has been built by farmers to store their own grain in the Corn Belt States.

Farmers and others may build more elevator storage capacity during the next 15 years than they have during the past 15. New elevators with capacity of 100,000 bushels or more require a large capital investment. It should be made at locations that will contribute the least to marketing costs. For once the investment is made, and the elevator built, it may be too late to correct the situation. It is impossible to change the location of an eleva-

² Estimate based on survey made by Roy Hendrickson, Executive Secretary and Washington representative of the National Federation of Grain Cooperatives.

³ Estimate based on figures from Farm Credit Administration, U. S. Department of Agriculture, Washington, D. C.

tor made of concrete and steel, and expensive to substantially alter its original design and machinery layout.

In addition, to be a sound investment, such storage must be used

most of the expected span of years it will last—as much as 50 years in the case of a concrete and steel elevator. Planning for facilities to be used that long makes the problem particularly complicated.

The Problem

THIS circular is limited to consideration of the problem of determining farmers' cash grain storage costs at various locations

when using permanent-type facilities and the factors causing these cost relationships to change over a period of years.

Study Objective and Method

THE objective of the study was to provide basic information farmers and others may use as a guide in planning for future facilities to store grain. It was intended to help answer such questions as: What are the present relative costs to farmers storing at home or at elevators? What are the factors to be considered in determining farm storage costs at a specific location? What are the reasons for the shift from farm to elevator storage in much of the wheat belt and what significance does this shift have for other grain producing regions?

To meet the need for this basic information the Farm Credit Administration did research work in cooperation with selected land grant colleges and universities, with funds appropriated under the Agricultural Marketing Act of 1946.

Results obtained in the study of this problem have been published in three Farm Credit Administration bulletins covering three study areas—Where and How Much Cash Grain Storage for Oklahoma Farm-

ers; Where and How Much Cash Grain Storage for North Dakota Farmers; and Where and How Much Cash Grain Storage for Indiana Farmers.⁴

Information came from personal interviews with 834 farmers and 207 elevator operators. Table 1 shows the nature of the sample taken from cash grain producing areas of Oklahoma, North Dakota and Indiana. Oklahoma was chosen as representative of the cash hard winter wheat producing area where the warmer climate usually pushes farm storage costs up, North Dakota as representative of lower farm storage costs in the cash spring wheat region, and Indiana as representative of the heavy feed grain area.

⁴ Hall, T. E., Larson, A. L., Whitney, H. S., and Meyer, C. H. *Where and How Much Cash Grain Storage for Oklahoma Farmers*. U. S. Farm Credit Admin. Bul. 58, 1950.

Hall, T. E., Hemphill, P. V., Meyer, C. H., and Davis, W. K. *Where and How Much Cash Grain Storage for North Dakota Farmers*. U. S. Farm Credit Admin. Bul. 61, 1951.

Hall, T. E., Hicks, J. W., Davis, W. K., and Coats, Norman. *Where and How Much Cash Grain Storage for Indiana Farmers*. U. S. Farm Credit Admin. Bul. 68, 1952.

Table 1—Number of schedules obtained by personal interviews for the storage years, 1947–48 to 1949–50 ¹

State	Storage year covered	Sample number of—		
		Communities or trade territories	Data obtained by interview from—	
			Elevator managers	Grain producers
Oklahoma	1947–48	24	73	201
North Dakota	1948–49	45	76	312
Indiana	1949–50	48	58	321
Total		117	207	834

¹ A random sample of farmers was selected from the elevator's list of grain marketing patrons in each of the communities previously selected at random from the grain-producing areas of the three States.

Influence of Mechanization

LET'S look first at some of the changes that have brought about decided shifts from farm to elevator storage. Studies in each of the three States showed that increased mechanization was the motivating force. The increasing use of trucks and combine harvesters

was a major factor. Other developments such as farm production practices and improvements in grain handling machinery, particularly at elevators, were also important.

Farmers therefore need to study carefully present and potential cost

The shift from binders and threshing machines to combine harvesters has had a marked influence on marketing and storage practices of farmers with their cash grain.



changes due to mechanization and large volume operations when considering the grain marketing and storage facilities they will have to use for the next 25 to 50 years. A starting point for their study of specific problems is to see what has happened in the past that influences costs of storing cash grain at home and at elevators.

On Farm Storage

Grain farmers know of the shift from binders and threshing machines to the combine harvester and its influence on marketing practices. Most of them are old enough to remember the general use of teams and wagons to haul grain to market.

Thirty years or more ago it took too many additional teams, wagons and drivers to haul grain from the threshing machine to town as compared with those needed to haul to the farm granary. These extra costs compared with farmers' cost of doing their own hauling when going to town for other reasons and during a season when their time was less valuable, made farm storage a necessity for those who lived several miles from town.

Now with combines and farm trucks, this cost situation is reversed. Grain usually goes from field to town with the same truck and labor used to unload in farm bins. Actually, labor and transportation are cut down from two to one handling by hauling from field to town rather than from field to farm bin, then to town. Therefore, use of farm storage for grain that is to be marketed through the local ele-



Many elevators with obsolete equipment have had to be abandoned. Other out-of-date ones still operate but not very successfully.

vator means extra cost of handling and transportation compared to hauling directly from the combine to town.

Obviously, this doesn't apply to grain to be used at home rather than marketed. Also it wouldn't apply where elevator storage is not available or receiving capacity is so limited that farmers lose a lot of time waiting in line to unload their trucks.

On Elevator Storage

Technological developments have influenced certain grain elevator operations during the past 30 or more years. New grain varieties, production equipment, weed control methods, and cultural and farm management practices have in many



Modern elevators like this can handle more bushels faster and at less per bushel cost.

instances substantially changed the kinds, quantity, and quality of grain available for market in a given community served by an elevator. Of course, these changes in turn influenced elevator volume, facility and equipment needs, and overall operations.

Elevator managers with long experience well remember how the combine and truck have brought about changes in elevator plant and equipment. They have seen wagon scales replaced with truck scales. Later the original truck scales were replaced with those of more capacity and still later by platforms and capacities large enough to accommodate semi-trailer trucks. They have seen elevator driveways widened, and faster legs, truck hoists, and loading-out scales installed. They have seen storage tanks added

to old elevators or completely new elevators built to provide much more storage.

They can probably recall elevators at small crossroad points which were abandoned because of their obsolete equipment and the consequent loss of volume. They also know of elevators still operating, but not very successfully, because of their failure or inability to adjust to the changes in farmers grain marketing, transportation and utilization methods, and in farm supply purchasing practices.

They will recall the changes brought about when electric power replaced the old gasoline engine. Even this is relatively recent in terms of the expected life of a good elevator.

Most present-day elevator "sideline" services have been motivated by technological changes—in transportation, in sources of power, and in feeding and other farm supply utilization practices. Power grinders and mixers and new developments in animal and poultry nutrition are responsible for elevator custom grinding and mixing of feeds and for commercial feed sales on a scale unheard of 30 years ago.

These changes in elevator mechanization and in operating practices have resulted in increased grain handling and storage efficiency during the same 25 to 30 years. Elevators now handle more bushels faster and at less per bushel cost. They use modern power and mechanical equipment for receiving and otherwise handling grain to increase volume and lower costs. This equipment makes it easier to turn, treat and otherwise condition grain

and here again gives elevators an advantage compared to doing the same job with farm equipment and storage facilities. Elevators have reduced losses and eliminated some of the costs resulting from grain quality deterioration, credit extension, and grain speculation. They have further lowered costs of labor

and plant by adding the sideline services already mentioned to complement the grain marketing and storage activities.

As elevators have lowered costs these economies have generally been reflected in the charges farmers pay for grain marketing and storage services.

Farm Storage Costs

CHANGES just described have occurred in about the same period of time that a new farm granary would be expected to last—far less than the expected useful life of a concrete and steel elevator. These shifts account for most of the changing relationship between the farmer's cost of storing grain for market at home and the cost through his local elevator.

The present costs of storing grain on the farm vary from practically nothing out-of-pocket to 50 cents or more per bushel, depending largely on farmers' experience in maintaining quality. Other factors responsible for variation in per bushel costs are: Type and costs of granary and handling equipment; extent to which available capacity is used; value of the grain; its condition; and differences in rates of taxes, insurance, transportation, and labor expense.

In the three States studied, costs were broken down for storing combine harvested grains at home into three separate groups—fixed expense based on the valuation of the building and equipment; variable items, on the grain itself; and costs for transportation and labor for putting grain into the bin on the farm

and hauling it to town later.

In all three regions these costs were figured on the basis of new



Changes in transportation and handling brought about by mechanization on the farms have come in about the same period of time a farm granary is expected to last and account for most of changes in cost relationships between farm and elevator storage for cash grain.

steel bins. These were valued at \$1,250 for three 1,000 bushel bins including a portable mechanical small grain conveyor. Grain stored was given a value of \$2 a bushel, roughly the farm value of wheat at the time of the studies.

The examples used here were based on 60 percent use of available bin capacity. The average use reported in the three States studied were 41 percent for Oklahoma, 57 percent for North Dakota, and 60 percent for Indiana.

The average reported length of time in farm storage was also used—about $7\frac{1}{2}$ months.

The same size of bins and amount of grain stored were used for each State in order to point up the differences which variable expenses contribute to storage costs in the three study areas.

The data used from the three States is not for the same storage year. However, farmers and others described the three years studied as average to slightly better than average storage years. As grain went into storage with average to low moisture content, the cost differences between the States studied due to shrinkage and loss in quality during storage are believed to be reasonably typical.

Fixed Costs

Table 2 shows the fixed costs of interest, depreciation, insurance on buildings and equipment, and taxes—all based on the \$1,250 bin and conveyor value. They were 6.2 cents in Oklahoma, 6.4 cents in North Dakota and 6.6 cents in Indiana. Interest and depreciation were the largest items in all states.

Variable Costs

Table 2 also shows the variable cost items of shrinkage and loss in quality, insurance on grain, treating and conditioning and non-insurable risks. These were 7.8 cents a bushel for Oklahoma, 4.8 cents a bushel for North Dakota and 8.8 cents a bushel for Indiana. Shrinkage combined with loss in quality was the largest item in all three states, but ran lowest of all in North Dakota because of the cooler climate and better farm storage facilities.

Weevil infestation, heat damage, musty or sour grain, and so-called sick wheat caused the grain quality losses during the storage period. The current activities of the Food and Drug Administration to clean up insect infestation, rodent filth, and other impurities sometimes found in grain will make this quality problem even more important to farmers in the future, as they may be severely penalized for wheat that contains such impurities.

A majority of farmers have experienced serious quality losses in their farm bins at some time in their storage experience. It has been the most important factor influencing them to use elevator storage when it is available, even when they have good bins at home. In Indiana where little elevator storage is available, it is the major reason farmers sell their grain from the combine rather than storing it on the farm.

Extra Transportation and Labor

The extra transportation and labor for the double handling in putting cash grain into farm storage

Table 2.—Comparative cost of storing cash wheat on farms in Oklahoma, North Dakota and Indiana ¹

Item	Average cost per bushel stored ²			Your cost
	Oklahoma	North Dakota	Indiana	
	Cents	Cents	Cents	
I. Fixed expenses on facilities and equipment (\$1,250 value): ³				
(a) Interest at 4 percent.....	2.8	2.8	2.8	
(b) Depreciation at 4 percent.....	2.8	2.8	2.8	
(c) Insurance on buildings and equipment.....	.3	.5	.4	
(d) Taxes.....	.3	.3	.6	
	6.2	6.4	6.6	
II. Variable expense from use of above facilities:				
(a) Shrinkage and loss in quality ⁴	5.6	2.9	7.1	
(b) Insurance on grain ⁴	1.3	1.0	.7	
(c) Treating and conditioning.....	.4	.4	.5	
(d) Risk not insurable (nominal).....	.5	.5	.5	
(e) Bin repair and maintenance ⁵				
	7.8	4.8	8.8	
III. Extra transportation and labor.....	3.1	2.9	3.1	
Total.....	17.1	14.1	18.5	

¹ Prepared from basic data reported in detail in Farm Credit Administration Bulletins 58, 61 and 68 published in cooperation with Agricultural Experiment Stations in Oklahoma, North Dakota and Indiana. Storage years were: Oklahoma, 1947-48; North Dakota, 1948-49; and Indiana, 1949-50.

² Based on 60 percent utilization of available farm storage capacity. Actual percentage utilizations were: Oklahoma, 41 percent; North Dakota, 57 percent; and Indiana, 60 percent. In example 1,800 bushels are stored in 3,000 bushels capacity of the 3 bins.

³ Three new 1,000-bushel steel bins on recommended foundation ready for use valued at \$900. One mechanical loader valued at \$350—total \$1,250.

⁴ Calculated for \$2 per bushel wheat.

⁵ In practice farmers do not spend much on repair and maintenance of steel bins.

and then marketing it in town at a later date cost farmers 3.1 cents a bushel in Oklahoma, 2.9 cents a bushel in North Dakota, and 3.1 cent a bushel in Indiana.

Total Costs

Farmers wanting to make a choice between storing at home or through the local elevator can calculate their total costs from table 2 in two ways.

First, if they plan to build or buy new bins, they will add together the fixed costs, as well as variable cost items, and extra transportation

and labor costs. In Oklahoma these averaged 17.1 cents a bushel, in North Dakota, 14.1 cents, and in Indiana, 18.5 cents.

Second, farmers who already have good facilities will omit fixed costs in reaching a decision as between using farm and elevator storage. Fixed costs on bins they now own either have been or must be paid, and cannot be eliminated. Since they have this expense regardless of where they store they do not consider it as a factor in making their choice between farm and elevator storage.

Hence, they will omit fixed expense items and consider only the variable expense items and those for extra transportation and labor.

These amounted to an average of 10.9 cents a bushel for Oklahoma, 7.7 cents for North Dakota, and 11.9 cents for Indiana.

Elevator Storage Costs

FARMERS usually have two questions about elevator storage when they are considering its use: first, the storage rates they will pay; and second, whether they can sell elevator stored grain to as good advantage as that stored at home.

Rates Farmers Pay

Rates farmers pay for elevator storage are based on managements' operating cost, experience using facilities available and on the degree of competition that exists for farmers storage patronage. Rates are usually quite uniform for neighboring competing elevators. However, areas as far removed from one another as the States studied may show considerable variation because of area and regional differences in competition, or the lack of it, for storage patronage. Average annual rates in the States studied varied from 10 to 16.8 cents a bushel (table 3).

North Dakota has a law that sets the maximum rate schedule that may be charged at warehouses in the State. It provides for 15 days free storage from the date the farmer delivers his grain to the elevator, then $\frac{1}{36}$ of a cent a day may be charged during the storage period. While North Dakota has some competition among elevators for farmers' patronage, nearly all elevators charge the maximum rate.

Present operating and storage costs are so high that this maximum rate is still low in comparison.

New elevators from 100,000 bushels capacity up to several hundred thousand bushels were commonplace at Oklahoma country shipping points as early as the 1947-48 storage year. Sufficient capacity to receive and store grain at harvest is an important competitive advantage. Competition in Oklahoma is such that some elevators lower their storage rates as an inducement for patronage.

Few Indiana country elevators will accept farmer-owned grain for storage. Not many have adequate capacity. Those that do find storing soybeans for processors more attractive than storing for farmers.

Table 3.—Average rates farmers paid for elevator storage in Oklahoma, North Dakota and Indiana

Storage period	Average elevator storage rates ² per bushel in—		
	Oklahoma	North Dakota	Indiana
	Cents	Cents	Cents
3 months...	4.0	2.1	4.2
5½ months ¹	6.8	4.5	7.7
Full storage year.....	10.3	10.0	16.8

¹ About the average period farmers store grain in elevators.

² Storage years were 1947-48 for Oklahoma; 1948-49 for North Dakota, and 1949-50 for Indiana.

Other small grains are often in poor condition when harvested for storage on farms or at elevators. Under these conditions, charges farmers pay for elevator storage are higher than in other States.

Marketability

"Can I sell my grain from elevator storage as well as from farm storage," is a second question farmers check on when considering the use of elevator storage. Information obtained from elevator managers and farmers in the three States indicated that elevator stored grain was bought from farmers for the same price as grain sold out of farm storage. The elevator's daily bid price was used regardless of where the grain was stored.

Farmers storing on their farms may have a choice of selling at more than one elevator, but competition is usually sufficient in any cash grain area to result in about the same price bids from most nearby elevators. Practically all elevators buy and sell on daily bids, regardless of whether the grain is

elevator or farm stored.

From the standpoint of convenience in selling, elevator storage has an advantage. Grain can be sold any market day—by telephoné, if necessary. Delivery of farm-stored grain to town, particularly during winter months, may be difficult or inconvenient and thus handicap selling on a specific daily market.

Farmers thus found they had little reason to hesitate about using elevator storage for wheat or other grains to be marketed through the elevator, because of the marketability of grain stored there. The convenience in selling more than offset any disadvantages reported by farmers interviewed. The only exceptions found to the foregoing were a few farmers who deliberately chose to use elevator storage for their wheat at terminal markets that were out of position price-wise with their normal market channels. They preferred this marketing penalty, necessitated by unusual demand for space at normal market locations, to not being able to store their cash grain that year.

Comparison of Farm and Elevator Storage Costs

TO sum up the comparative costs of farm and elevator storage as shown in the three States studied, let's consider costs based on two different situations—the first, that of the farmers who will need to construct or purchase new bins and must consider both fixed and variable costs, and the second, the situation of those who already have good bins and will therefore disregard the fixed costs in making their decisions.

For the first group of farmers—those who will need to buy new bins and equipment to store on farms—elevator storage was substantially cheaper for the average elevator storage period of $5\frac{1}{2}$ months. The difference was 9.5 cents a bushel in Oklahoma, 8.8 cents a bushel in North Dakota and 10 cents a bushel in Indiana.

For the second group—those who already have good farm bins—elevator storage was also cheaper for

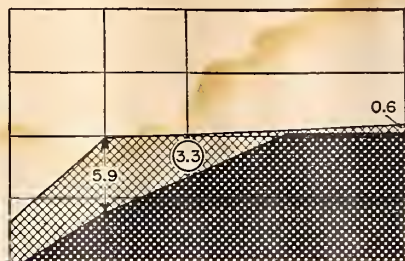
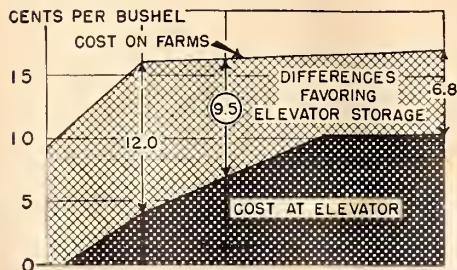
Figure 1.—Comparison of Farmers' Cost of Storing Wheat for Market on Farms and at Elevators* When:

**A. THEY PLAN TO USE NEW BINS
(INCLUDES FIXED COST)**

**B. THEY USE BINS NOW OWNED
(FIXED COST OMITTED)**

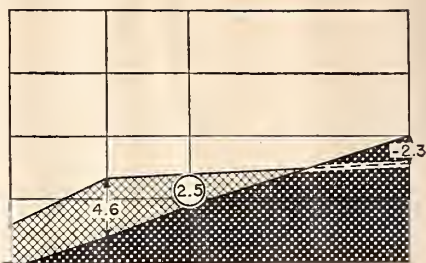
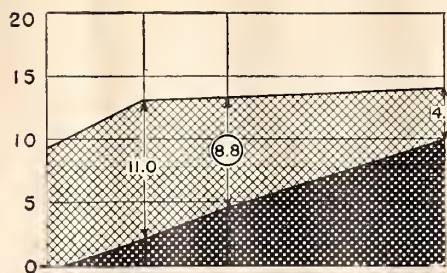
OKLAHOMA

1947-48 STORAGE YEAR



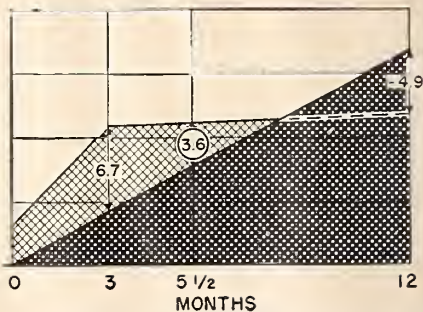
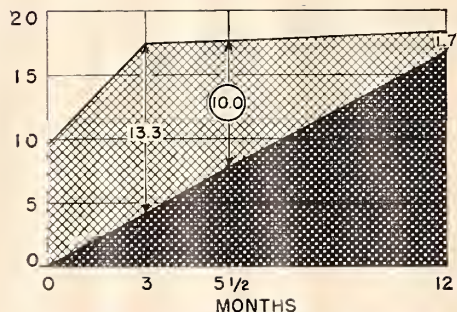
NORTH DAKOTA

1948-49 STORAGE YEAR



INDIANA

1949-50 STORAGE YEAR



*THE AVERAGE PERIOD FARMERS STORED AT ELEVATORS WAS 5 1/2 MONTHS -
CENTS PER BUSHEL FIGURE FOR THAT PERIOD IS CIRCLED

| 3287-1

the average storage period of $5\frac{1}{2}$ months—by 3.3 cents a bushel in Oklahoma, 2.5 cents a bushel in North Dakota, and 3.6 cents a bushel in Indiana.

The six charts in figure 1 tell the story graphically of farm vs. elevator storage costs on grain farmers market through elevators. The three charts on the left represent costs in the three States for farmers considering buying and using new bins and equipment. Fixed costs are included. The three on the right represent costs in the three States for farmers who already have good granaries. Here fixed costs are omitted and only variable and extra transportation and labor costs considered. Farmers with good farm granaries available will consider only the expense items of shrinkage, loss of quality, grain insurance, treating, conditioning, risk, and the extra handling and transportation involved in farm storage if they use elevator storage. They have paid or are paying the fixed costs of their farm facilities regardless of where they store.

These charts show how costs vary for periods ranging up to 12 months with differences shown for three time periods— $3\frac{1}{2}$ months, $5\frac{1}{2}$ months, and 12 months—for the three States studied.

The lower part of each chart, the dark portion, shows how the average charges farmers pay at the elevator accumulate throughout the storage year. These move up gradually as the storage period lengthens. The top line shows the same figure for average farm storage costs. These charts show that farm

storage costs start off high because of the extra transportation and labor involved in getting grain into farm bins and the fixed expenses which exist from the start. In practice these farm costs reach a peak quickly because most shrinkage and quality deterioration of wheat occurs in the first 2 or 3 months of farm storage.

The dotted portion of each chart shows the difference between farmers' home bin costs and elevator storage costs during the year. As can be seen, costs where the farmers plan to construct new bins are substantially higher for farm storage than for elevator. Farm storage costs run especially high for the shorter storage periods and the margins between them and elevator storage costs decrease throughout the year.

The differences aren't so great where farmers already have good bins and therefore omit the fixed costs. When omitting fixed costs, both North Dakota and Indiana show farm storage cheaper than elevator storage, when the storage period exceeded about 9 months. Oklahoma's maximum elevator charge for the full storage year remained less than farmers' costs for using their own granaries.

These charts also point up the differences in average elevator charges found in the three States. As previously mentioned, these differences are due mostly to availability of modern elevator space and the resulting degree of competition that exists in the respective States for the farmers' grain marketing and storage patronage.

Special Problem of Ear Corn Storage

INDIANA, a feed grain and soybean production State, was the only one of the three States in which special attention was given to ear corn storage costs.

Figures showed that farmers' costs for storing new crop ear corn for market in new, permanent-type cribs at full capacity in Indiana were about the same per bushel as those already reported on for wheat on the basis of 60 percent capacity used. Costs of storing corn at elevators are usually at the same rates as those given previously for wheat. Fixed costs were higher for corn, but losses due to quality deterioration and shrinkage, other than moisture loss, were less.

Even so, farmers usually received a higher net market return on new crop corn sold from farm crib storage than on that hauled directly from the field to town and sold later from elevator storage when the elevator charges plus discounts for harvest moisture were considered. The natural drying that occurs in farm cribs, mostly during the late spring and summer months, saved

harvest moisture discounts and accounted for the difference.

Farm storage costs for ear corn in Indiana for 1949-50 averaged 17.5 cents a bushel.⁵ This included fixed costs based on a valuation of \$4,350 for a new 4,000-bushel double crib and mechanical conveyor of the type commonly used by farmers in the heavy cash corn production area. Average rates of expenses were determined from over 300 personal interviews with Indiana corn producers. On the valuation of \$4,350, fixed expenses were 9.5 cents for each bushel of capacity. They included interest at 4 percent, or 4.3 cents for each bushel capacity. Depreciation at 3 percent was 3.3 cents a bushel, and insurance, taxes, and a small maintenance reserve was 1.9 cents a bushel. If the crib is not used to full capacity these costs would be proportionately higher.

As in the case of combine harvested grains, shrinkage, excess moisture and quality deterioration were the most important variable items of expense. Loss of corn from rodents, handling and the like, averaged 1.8 percent, or 2.2 cents a bushel. Market discounts for excess moisture at harvest averaged 6.5 cents a bushel. The average discount for moisture of grain sold out of farm storage was only 1.5 cents a bushel. Thus, under Indiana crop and storage conditions during the 1949-50 year, farm storage saved

Type of double corn crib used as an example in study of ear corn storage costs on farm.



⁵ Hall, T. E., Hicks, J. W., Davis, W. K., and Coats, Norman. *Where and How Much Cash Grain Storage for Indiana Farmers*. U.S. Farm Credit Admin. Bul. 68. 1952.

an average of 5 cents a bushel in discounts for excess moisture.

Costs from damage, treating, and conditioning averaged low that year. There were a few cases in which farm-stored corn went out of condition and was marketed with several cents discount for damage. Grain insurance was four-tenths of a cent a bushel. Together these variable items were 4.9 cents. Extra transportation and labor in and out of farm storage averaged 3.1 cents, making total variable expenses of 8 cents a bushel.

From the standpoint of future cost relations between farm and elevator storage, farmers marketing corn through commercial channels should be considered in two groups—a small group producing corn primarily for market and a larger group of farmers who feed most of their production. Farmers producing primarily for market may feed some, but are concerned mostly with corn as their major cash crop. They are often bigger producers and are located in the best producing areas of the corn belt. The larger group who mostly feed their production sell only that portion not needed as feed or feed reserves.

In both groups farmers who have good cribs find it better to store new crop ear corn for market at home. Since they have good cribs available, fixed costs would be disregarded in deciding where to store. The farm storage costs influencing their decisions would only be the items listed as variable costs and extra transportation and labor.

Those storing ear corn primarily for their own feeding operations—

the second group—would not even consider all variable costs. Extra transportation and labor and discounts for excess market moisture would be omitted. They will continue to build new cribs as needed for this type operation.

But the group producing corn as a major cash crop may have a different outlook regarding the construction of new, permanent-type cribs when modern elevator storage becomes readily available. They may justly hesitate to build. Fixed costs for a good crib are high. These farmers are going to market most of their corn through the elevator anyhow. And they will have to store most new crop corn for 7 to 10 months before natural drying has progressed to the point at which market discounts due to excess moisture would not be a cost factor.

This latter group may well consider the following possible developments which may influence their storage practices: (1) Advantages of earlier harvests compared with cost of artificial drying; (2) development of field harvester-shellers; and (3) lower elevator storage charges in the corn belt in relation to farm storage costs that would probably result if considerable elevator storage were built.

If farmers decide that one or more of these changes are coming soon, they may decide not to invest in permanent-type new cribs but use less expensive temporary cribs until future developments are clearer.

Providing new permanent-type crib storage for old crop ear corn

not needed at home for feed or feeding reserve would seldom be economical. Year-old corn will ordinarily be dry—the advantage of natural drying pointed out for new crop ear corn will not exist. Capacity to store year-old corn on farms for market would probably be used considerably less during the life expectancy of the new crib

than that previously discussed for new crop ear corn. Thus, fixed costs per bushel stored would be higher. Therefore, most farmers will find it cheaper to pay elevator storage charges or sell, rather than build a permanent-type crib to store old crop ear corn they expect to market through commercial channels.

Conclusions

THIS circular summarizes the results of studies on farmers' cost for storing grain they plan to market — those results, that is, which have general application for cash grain farmers and others who may want to decide where to build new permanent-type storage facilities for storing farmer-owned grain. The results given here are for comparative purposes and serve as reasonable approximations of the items of costs. Actual costs at specific locations vary widely from year to year and from place to place.

Highlights of these findings are:

1. *Any operator—farm or elevator—should not build storage facilities or use those already available unless he is prudent in dealing with the risk and responsibility associated with his job of maintaining stored grain quality.* In extreme cases quality deterioration on one lot of grain can equal the cost of a new farm granary or elevator storage addition. It may be particularly costly now in view of the current program of the Food and Drug Administration to condemn grain they say is not good for human con-

sumption. There are still those storing grain who learn of this cost the hard way. But that way involves too much risk and the cost is likely to be far too high.

2. *Empty capacity in grain storage facilities can, in itself, make operations unprofitable at either farm or elevator locations.* Fixed costs per bushel stored increase directly in proportion to the percentage of available capacity not used. They also vary with the type, size, and location of the facility. All grains must be stored until used or sold. Size of crop and carryover stocks vary tremendously from year to year. Some empty capacity is inevitable. The problem is to have it in the type and size of facility and at a location that will hold marketing costs as low as possible. This problem deserves careful study by all concerned with new storage structures for grain.

Research is currently under way to provide some help with this problem.

3. *Farmers' storage cost relationships by locations have been changing until elevator storage is usually cheaper, particularly*

in the wheat belt, than average farm storage. The change has been slight from year to year but amounts to considerable over the period of years a new granary or elevator is expected to be used.

When farmers are able to store their grain through their local elevators and are not forced to wait hours to unload, the change has progressed in the past 30 years to the following general situation:

(a) Most farmers are finding elevator storage considerably cheaper than farm storage if they have to build a new, permanent-type farm granary to store combined harvested grains produced for market.

(b) Most farmers are finding elevator storage cheaper to use than farm granaries they now own unless the storage period is longer than average.

(c) Most farmers are finding it cheaper to use elevator storage than to build a new, permanent-type farm crib or granary to store *old crop corn* to be marketed.

(d) Most farmers are finding it cheaper to build new, permanent-



Results of these studies show farmers usually find it cheaper to store grain in elevators than on farms if they aren't forced to wait hours outside the elevator to unload.

type cribs for *new crop corn* produced for market than to use elevator storage. The present general advantage for farm crib storage in this case is slight.

(e) It is still considerably cheaper for farmers to store new crop ear corn for market in cribs they already own.

Other Publications Available

Agricultural Cooperation in the United States, Bulletin 54, *Ward W. Fetrow and R. H. Elsworth.*

Legal Phases of Cooperative Associations, Bulletin 50, *L. S. Hulbert.*

Story of Farmers Cooperatives, FCS Educational Circular 1, *R. H. Elsworth.*

Organization Structure of Farmers' Elevators, Circular C-115, *Harold Hedges.*

Where and How Much Cash Grain Storage for Oklahoma Farmers, Bulletin 58, *T. E. Hall, A. L. Larson, H. S. Whitney and C. H. Meyer.*

Where and How Much Cash Grain Storage for North Dakota Farmers, Bulletin 61, *T. E. Hall, P. V. Hemphill, C. H. Meyer, and W. K. Davis.*

Where and How Much Cash Grain Storage for Indiana Farmers, Bulletin 68, *T. E. Hall, J. W. Hicks, W. K. Davis, and Norman Coats.*

Using Your Co-op Elevator, Circular E-8, *Harold Hedges.*

Copies of these publications may be obtained upon request while a supply is available from the

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